

surface is  $3\frac{1}{8}$  inches long. A second curve shows what length of grating will fill the telescope of aperture 1.5 inches at varying angles of emergence of the diffracted beam.

Consider a case in which it is desired to observe the C line in the spectrum of third order with a spectroscope in which the telescope and collimator are fixed at an angle of  $30^\circ$ . On the diagram it is seen that two positions of the grating are possible—one in which the action of the grating is magnifying, the other where it is the reverse. Which of these positions is best will depend on the object of the observation.

In this connection it may be remarked that the actual brightness of the spectra produced by a given grating probably depends on conditions which cannot be completely controlled, in the shape of the groove cut by the ruling diamond. The brightness of a given spectrum for given values of incidence and emergence is in general different according to which end of the ruled lines is uppermost (the lines being considered vertical). Hence, if particular values of incidence and emergence are desirable, the brightness may be in general increased or diminished by turning the grating "head for tail."

I am induced to publish the diagram, because I have found it of very great assistance in designing a spectroscope, and also in actual use of a grating spectroscope. So far as I am aware, no such diagram is accessible, though the simplicity of its construction would lead one to expect it has been long in use in laboratories.

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*Comet Swift, March 1892.* By H. C. Russell, B.A., F.R.S.

We received the cablegram of the discovery of this comet on March 9, but owing to clouds could not see it until the morning of the 11th, when some micrometer measures were obtained, also a photograph, showing five equidistant rays, the outside ones enclosing an angle of  $25^\circ$ . There was not much difference in their length, the longest one measuring 35 minutes of arc. The exposure given was 1 hour 50 minutes, but owing to the frequent passage of thin cloud and the bright moonlight the picture of the rays is very faint. Cloudy weather again intervened, and we did not see the comet until the morning of the 22nd, when the air was much clearer, but there was a good deal of passing cloud; during an exposure of 2 hours 23 minutes clouds covered the comet for 28 minutes; the  $11\frac{1}{2}$ -inch equatoreal showed no tail except a slight hazy extension, and not a sign of any ray. The photograph shows no less than eight rays, two of which extend to the edge of the photograph and may have been even longer; the recorded length is, however,  $1^\circ 10'$ . On the side of these two long rays three new rays appear, and one of

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these, shown in the photograph of March 11 as springing from the head, is now found at some distance from the head, and not visibly joined to it. The longest rays, as well as the three new ones, are on the south side of the tail, and these seem to have a definite connection with a jet from the nucleus, which extends forwards and then bends round to these rays.

On the morning of March 25 a break in the clouds occurred just before daybreak, and a photograph was taken with 15 minutes' exposure. This shows some of the rays close to the head, and the coma two-thirds of the diameter of it is shown on March 22. This affords a measure of the brightness of these parts, for with a similar sensitive plate, and 6 minutes' exposure, a star of the 11th magnitude would be photographed.

The rays in all the photographs are very faint, and their full extent only seen by looking through the negatives at a suitable light or at a cloudy sky. I send the negative of March 22, which shows the rays best. It will be observed that the plate has a *réseau* on it, and is, in fact, a star plate; and this afforded the opportunity of making an enlarged drawing of it, the details being very carefully drawn in each square by Mr. Sellors, so that the length, breadth, and positions of the rays are shown to scale. Their relative brilliance has been slightly increased in the drawing, so that they can be more easily seen in the photographic copies sent herewith than in the original. The weather and the moonlight have been against the photographs and the observations, and perhaps may to some extent account for the fact that these rays could not be seen with the 11½-inch. However, from their relative strength in the photograph, I am disposed to think that their actinic light is stronger than that of other parts—in fact, that we have here a picture of selected parts, selected by their actinic brightness, just as the sensitive plate brings to view in the brighter parts of some nebulae details of structure which are invisible, under circumstances which seem to leave no doubt that the sensitive plate makes a selection amongst celestial colours as it does amongst terrestrial ones. I send (1) original negative of Swift's Comet, March 22; (2) negative of drawing of above, and (3) paper negative of the same. We obtained on the mornings of March 11, 22, 24 and 25 measures of the position of the comet with the 11½-inch equatoreal and filar micrometer. Those on the 24th were measured from a star not in the catalogues, which has not yet been observed.

*Observatory, Sydney :*  
1892 March 27.

The photographs are placed in the Library.

OBSERVATIONS OF COMET SWIFT, MARCH 1892.

Pilar Micrometer Observations, made with the 11½-inch refractor of the Sydney Observatory.

1892	Syd. M. T.		Δ R.A.		Δ N.P.D.		R.A. app.		log p. Δ	N.P.D. app.		log p. Δ	Red. to app. place. *	Observer.
	h	m s	m	s	'	"	h	m s		°	' "			
March 10	16	17 31	-0	18.97	+1	45.3	19	14 10.28	0.662n	118	43 34.2	0.359	-0.84 + 5.6	1 R. P. Sellors
"	21	16 50 20	-1	28.90	-5	24 11	20	4 33.15	0.589n	108	22 55.0	0.495	-0.70 + 8.5	2 R. P. Sellors
"	24	17 37 45	+2	34.42	+8	39.6	4	20 17 30.33	0.488n	105	16 7.0	0.503	-0.62 + 9.2	3 H. C. Russell

Mean Places of Comparison Stars for 1892 O.

*	R.A. 1892'o.		N.P.D. 1892'o.		Authority.	
1	h	m s	°	' "	Arg. Gen. Cat. 26481	
	19	14 30.09	118	41 43.3		
2	20	6 2.75	108	27 48.9	Wash. Zones (1848), Zone 185, No. 77	
3	20	14 56.53	105	7 18.3	β <sup>2</sup> Capricorni Conn. des Temps, 1892	

*Observations of Swift's Comet (a 1892), made at the Royal Observatory, Greenwich.*  
(Communicated by the Astronomer Royal.)

The observations were made with the East, or Sheepshanks, equatorial, aperture 6·7 inches, by taking transits over two cross wires at right angles to each other, and each inclined 45° to the parallel of declination. Magnifying power 55. The observations are corrected for refraction, but not for parallax.

Greenwich Mean Solar Time.			Observer.	♂-★R.A.	Corr. for Refraction.	Log factor of Parallax.	♂-★N.P.D.	Corr. for Refraction.	Log factor of Parallax.	No. of Comps.	Appt. R.A. of ♂	Appt N.P.D. of ♂	Comp. Star.
d	h	m	s		s		''	''			<sup>h</sup> <sup>m</sup> <sup>s</sup>	<sup>°</sup> <sup>'</sup> <sup>''</sup>	
Apr.	22	14	7	0	A.C.	+ 30·57	+ 10 44·2	+ 0·1	9·5786	5	22 5 37·38	76 4 57·6	a
	26	14	11	37	T.H.	+ 12·21	- 5 55·3	- 0·3	9·5850	5	22 18 26·74	72 47 39·8	b
	26	14	20	44	A.C.	+ 13·89	- 5 55·6	- 0·1	9·5836	4	22 18 28·42	72 47 39·7	b
	29	14	17	46	L.	+ 26·50	+ 9 39·9	+ 0·3	9·5893	4	22 27 48·29	70 29 29·3	c
	29	14	21	57	C.D.	+ 26·65	+ 9 43·8	+ 0·2	9·5884	4	22 27 48·44	70 29 33·1	c
May	5	13	27	37	L.	+ 53·08	+ 16 24·0	+ 0·7	9·6027	3	22 45 40·06	66 14 44·6	d
	5	13	38	7	"	+ 9·75	- 6 28·1	- 0·1	9·6040	2	...	...	e
	5	13	43	42	"	+ 18·13	+ 0 36·1	+ 0·0	9·6044	2	...	...	f
	6	13	52	5	A.C.	+ 74·87	+ 13 32·4	+ 0·3	9·6066	3	22 48 38·83	65 34 17·8	g
	6	14	1	37	"	- 8·92	- 9 17·0	- 0·1	9·6058	5	22 48 38·73	65 34 1·2	h
	6	14	7	33	"	+ 230·93	- 24 22·5	- 0·2	9·6051	2	22 48 37·78	65 33 57·1	d
	7	13	58	17	B.	- 393·70	- 8 28·3	0·0	9·6080	1	22 51 30·44	64 54 59·4	k
	7	14	8	55	"	+ 361·15	- 11 12·2	- 0·2	9·6069	1	22 51 34·31	64 55 3·3	l
	7	14	15	26	"	- 620·00	- 12 20·3	0·0	9·6053	2	22 51 30·45	64 54 45·2	m